

We Claim:

1. An improved precipitation sensor to sense the presence of water upon an  
automotive glass of the type having an optical emitter, an optical receiver, a first  
5 mirror surface for collimating light emitted from said optical emitter and having a  
first leading edge, a second mirror surface for focusing said emitted light upon  
said optical receiver and having a second leading edge, and an electronic circuit in  
electrical communication with said optical emitter and said optical receiver, the  
improvement comprising:

10 said precipitation sensor including an intermediate reflector.

2. The improved precipitation sensor of claim 1, wherein:  
said intermediate reflector further comprises a first reflective region proximate  
15 said emitter.

3. The improved precipitation sensor of claim 1, wherein:  
said intermediate reflector further comprises a second reflective region  
proximate said receiver.

20 4. The improved precipitation sensor of claim 1 wherein:  
said intermediate reflector further comprises a first reflective region proximate  
said emitter and a second reflective region approximate said receiver.

5. The improved precipitation sensor of claim 2, further comprising:  
25 said first reflective region being adapted to substantially pass light falling  
upon said first reflective region at angles not giving rise to total reflection.

6. The improved precipitation sensor of claim 3, further comprising:  
said second reflective region being adapted to substantially pass light falling  
30 upon said second reflective region at angles not giving rise to total  
reflection.

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7. The improved precipitation sensor of claim 2 further comprising:  
said first reflective region having a first mean reflective point being displaced  
from said automotive glass at a distance at least as great as a distance said  
5 first leading edge of said first mirror surface is displaced from said  
automotive glass.

8. The improved precipitation sensor of claim 3, further comprising:  
said second reflective region having a second mean reflective point being  
10 displaced from said automotive glass at a distance at least as great as a  
distance said second leading edge of said second mirror surface is  
displaced from said automotive glass.

9. The improved precipitation sensor of claim 1, further comprising:  
15 a working optical path from said emitter to said first mirror surface to said first  
reflective region to an outer surface of said automotive glass to said second  
reflective region to said second mirror surface to said emitter.

10. The improved precipitation sensor of claim 9, further comprising:  
20 said working optical path being substantially within solid optical elements.

11. The improved precipitation sensor of claim 1, further comprising:  
said intermediate reflector including a field regulator.

25 12. The improvement of claim 2, further comprising:  
said first reflective region field including a field regulator.

13. The improvement of claim 3, further comprising:  
30 said second reflective region field including a field regulator.

14. The improvement of claim 11 wherein:

said field regulator comprises at least one cone.

15. The improvement of claim 1 wherein:

5            said first mirror surface, said second mirror surface, and said intermediate reflector comprise a single optical unit.

16. An improved precipitation sensor to sense the presence of water upon an automotive glass of the type having an optical emitter, an optical receiver, a first mirror surface for collimating light emitted from said optical emitter, a second mirror surface for focusing said emitted light upon said optical receiver, and an electronic circuit in electrical communication with said optical emitter and said optical receiver, the improvement comprising:

10            said second mirror surface being opaque and being placed intermediate to said optical receiver and a source of ambient light opposite of said automotive 15            glass from said second mirror surface.

17. The improved precipitation sensor of claim 16, further comprising:

20            said first mirror surface being aspheric.

18. The improved precipitation sensor of claim 16, further comprising:

25            said second mirror surface being aspheric.

19. The improved precipitation sensor of claim 16, further comprising:

20            said first mirror being coated with a reflective film.

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20. The improved precipitation sensor of claim 16, further comprising:

25            said second mirror being coated with a reflective film.

21. The improved precipitation sensor of claim 17 further comprising:

30            said first aspheric mirror being hyperbolic.

22. The improved precipitation sensor of claim 18 further comprising:  
said second aspheric mirror being hyperbolic.

23. An improved precipitation sensor to sense the presence of water upon an  
5 automotive glass of the type having an optical emitter, an optical receiver, a first  
mirror surface for collimating light emitted from said optical emitter, a second  
mirror surface for focusing said emitted light upon said optical receiver, and an  
electronic circuit in electrical communication with said optical emitter and said  
optical receiver, the improvement comprising:  
10 said emitter adapted to emit light in the visible light range.

24. The improved precipitation sensor of claim 23, further comprising:  
said second mirror surface being opaque and being placed intermediate to said  
15 optical receiver and a source of ambient light opposite of said automotive  
glass from said second mirror surface.

25. An improved precipitation sensor to sense the presence of water upon an outside  
surface of an automotive glass of the type having an optical emitter, an optical  
receiver, a first mirror surface for collimating light emitted from said optical  
emitter, a second mirror surface for focusing said emitted light upon said optical  
receiver, and an electronic circuit in electrical communication with said optical  
emitter and said optical receiver, the improvement comprising:  
20 said precipitation sensor having a field regulator.

26. A precipitation sensor adapted to detect water upon an automotive glass  
comprising;  
25 an optical emitter, a first mirror surface in optical communication with said  
optical emitter and adapted to reflect and collimate light emission from  
said optical emitter, an optical receiver, a second mirror surface in optical  
communication with said optical receiver and adapted to focus collimated  
30 light upon said optical receiver, and an intermediate reflector in optical

communication with said first mirror surface and with said second mirror surface.

27. The precipitation sensor of claim 26, further comprising:  
5           a first reflective region proximate said emitter and a second reflective region proximate said receiver.

28. The first reflective region of claim 27, further comprising:  
10           a first field regulator.

29. The second reflective region of claim 27 further comprising:  
15           a second field regulator.

30. The first field regulator of claim 28 further comprising:  
20           at least one cone.

31. The second field regulator of claim 29 further comprising:  
25           at least one cone.

32. The improved precipitation sensor of claim 27 further comprising:  
said first reflective region having a first mean reflective point being displaced  
from said automotive glass at a distance at least as great as a distance said  
first leading edge of said first mirror surface is displaced from said  
automotive glass.  
33. The improved precipitation sensor of claim 27, further comprising:  
30           said second reflective region having a second mean reflective point being  
displaced from said automotive glass at a distance at least as great as a  
distance said second leading edge of said second mirror surface is  
displaced from said automotive glass.

34. The precipitation sensor of claim 26, further comprising:  
said second mirror surface being opaque and being placed intermediate to said  
optical receiver and a source of ambient light opposite of said automotive  
glass from said second mirror surface.

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